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ASSIGNMENT BOOKLET 6A

MAT3038 Applied Mathematics 30
Module 6: Activities 1 and 2 Assignment

FOR STUDENT USE ONLY

Date Assignment Submitted:

Time Spent on Assignment:

(If label is missing or incorrect)

Student File Number:

Module Number: _____

FOR OFFICE USE ONLY

Assigned

Teacher: _____

Assignment

Grading: _____

Graded by: _____

Date Assignment Received: _____

Student's Questions and Comments

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Name

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correct course and module.

Teacher's Comments

Teacher

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Applied

Module

6

Mathematics 30

PATTERNS

ASSIGNMENT BOOKLET 6A



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LEARNING

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Summary

	Total Possible Marks	Your Mark
Activities 1 and 2 Assignment	75	

Teacher's Comments

Applied Mathematics 30
Module 6: Patterns
Assignment Booklet 6A
Activities 1 and 2 Assignment
Learning Technologies Branch
ISBN 0-7741-2298-6

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Students	✓
Teachers	✓
Administrators	
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General Public	
Other	



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ASSIGNMENT BOOKLET 6A
APPLIED MATHEMATICS 30: MODULE 6
ACTIVITIES 1 AND 2 ASSIGNMENT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 75 marks out of the total 195 marks for the assignments in Module 6. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

75

Activities 1 and 2 Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

2

1. Why is the first value in the data not used to produce the table of values in "Investigation 2: A Bouncing Ball?"

3

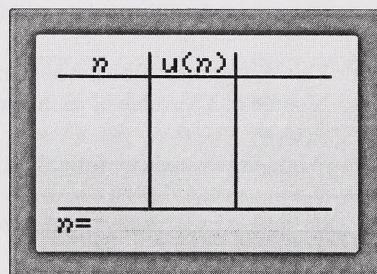
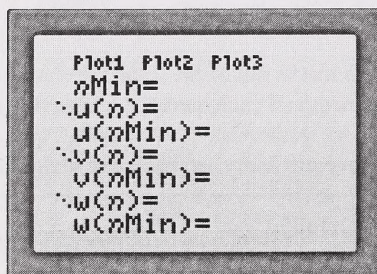
2. Answer exercise 1 of "Discussing the Ideas" on page 263 of the textbook.

Return to page 15 of the Student Module Booklet and continue with Activity 1.

3. Use a graphing calculator to answer exercises 1.b., 1.d., 2, and 9 of "Exercises: Checking Your Skills" on pages 264 and 265 of the textbook.

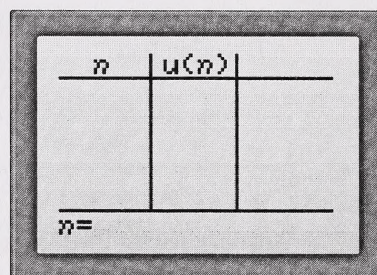
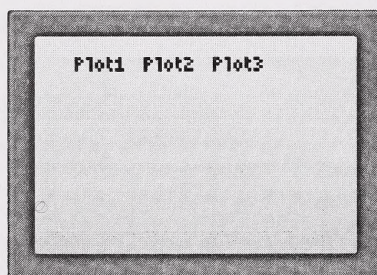
③

Textbook exercise 1.b.:



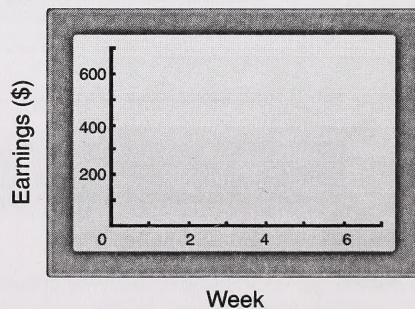
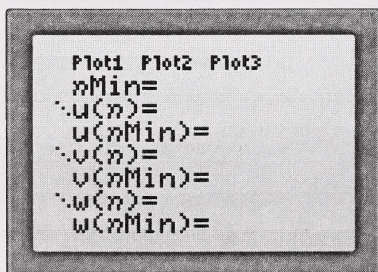
③

Textbook exercise 1.d.:



③

Textbook exercise 2.a.:



2

Textbook exercise 2.b.: _____

2

Textbook exercise 2.c.: _____

3

Textbook exercise 9:

Plot1 Plot2 Plot3

```

nMin=
u(n)=
u(nMin)=
v(n)=
v(nMin)=
w(n)=
w(nMin)=

```

n	$u(n)$
$n =$	

2

4. Refer to your answer to exercise 10 of “Exercises: Extending Your Thinking” on page 265 of the textbook. The total distance is equal to the distance from the start of the drop to the hard surface plus two times the distance the ball rises. Explain why you need to use twice the distance the ball rises to obtain the total distance.

Return to page 18 of the Student Module Booklet and continue with Activity 1.

- ③ 5. For the following sequence, determine the differences of terms and ratios of terms; then state whether the sequence is arithmetic or geometric.

14.4, 9.6, 4.8, 0, -4.8, -9.6, ...

- ② 6. Answer exercise 4 of “Discussing the Ideas” on page 270 of the textbook.

7. Answer exercises 4 and 7 of “Exercises: Checking Your Skills” on pages 271 and 272 of the textbook.

- ② **Textbook exercise 4.a.:** (Round your answer to the nearest hundredth of a percent.)

②

Textbook exercise 4.b.: (Use a spreadsheet. Attach a printout of your spreadsheet in the space provided.)

②

Textbook exercise 4.c.: _____

- ③ **Textbook exercise 7.a.:** (Use a spreadsheet. Attach a printout of your spreadsheet in the space provided.)

3

Textbook exercise 7.b.: (Attach a printout of your graph from your spreadsheet in the space provided.)

- ⑤
8. Modify the spreadsheet from exercise 2.c. of “Getting Started” on page 117 of the Project Book to find the radius (to the nearest tenth of a centimetre) of the least-cost container. Attach a copy of the new spreadsheet in the space provided.

5

9. Halley's comet first appeared in historical documents in 239 B.C. It was the two consecutive returns in 1531 A.D. and 1607 A.D. that caught Halley's attention. When will it first appear in the twenty-first century? (Assume that its period is fixed. Astronomy buffs will know that its period has varied considerably over the past 2200 years.) Show and explain your answer.

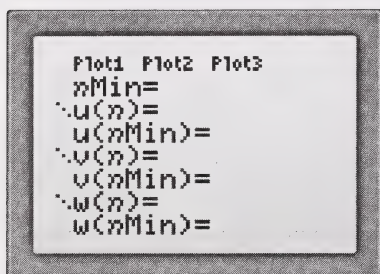
4

10. What is the common ratio of the following geometric sequence? Show and explain your answer.

4, 8.944, 20, ...

- ④ 11. Use your graphing calculator to determine the 15th term of the following sequence:

3.14, 5.14, 7.14, ...



n	u(n)
n=	

- ⑤ 12. A bakery sells fresh bread for \$1.65 a loaf. They sell day-old bread for \$1.00. The price of older bread is then reduced by 40% each day. When will you be able to buy a loaf of bread for a quarter?

⑥

13. In a particular auction, the starting price is reduced by a fixed percentage each day until the item is sold. The price of a model railroad car on the first day is \$470. If the price is reduced by 15% each day the item doesn't sell, how many days will have to pass before the price falls below \$60.

③

14. Answer exercise 3 of "Exercises: Checking Your Skills" on page 271 of the textbook.

Textbook exercise 3.a.: (Attach printouts of your spreadsheet in both numerical and formula form in the space provided.)

②

Textbook exercise 3.b.: _____

①

Textbook exercise 3.c.: _____

Submit your completed Assignment Booklet 6A to your teacher for assessment.
Then return to page 25 of the Student Module Booklet and begin Activity 3.

Student and teacher: Use this cover sheet for mailing or faxing.

ASSIGNMENT BOOKLET 6B

MAT3038 Applied Mathematics 30

Module 6: Activities 3 and 4 Assignment, Module Review Assignment, and Module Project

FOR STUDENT USE ONLY

Date Assignment Submitted:

Time Spent on Assignment:

(If label is missing or incorrect)

Student File Number:

Module Number: _____

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Assigned

Teacher: _____

Assignment

Grading: _____

Graded by: _____

Date Assignment Received: _____

**Student's Questions
and Comments**

Apply Module Label Here

Name

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Teacher's Comments

Teacher

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Applied

Module

6

Mathematics 30

PATTERNS

ASSIGNMENT BOOKLET 6B



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Summary

	Total Possible Marks	Your Mark
Activities 3 and 4 Assignment	40	
Module Review Assignment	40	
Module Project	40	
	120	

Teacher's Comments

Applied Mathematics 30

Module 6: Patterns

Assignment Booklet 6B

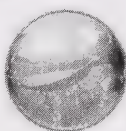
Activities 3 and 4 Assignment, Module Review Assignment, and Module Project

Learning Technologies Branch

ISBN 0-7741-2299-4

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Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
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ASSIGNMENT BOOKLET 6B
APPLIED MATHEMATICS 30: MODULE 6
ACTIVITIES 3 AND 4 ASSIGNMENT, MODULE REVIEW
ASSIGNMENT, AND MODULE PROJECT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 120 marks out of the total 195 marks for the assignments in Module 6. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

40

Activities 3 and 4 Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

4

1. Use the formula from exercise 5 of Part B of “Investigation 2: Some Properties of a Sierpinski Gasket” on page 286 of the textbook to calculate the area of the shaded triangles in the Sierpinski gasket after 10 iterations and after 100 iterations. Round your answers to 3 significant digits.

2

2. What do you notice about the area of the shaded triangles as the value of n increases?

3. Answer exercises 1.c., 1.d., 3.c., and 3.d. of “Exercises: Checking Your Skills” on pages 289 to 291 of the textbook.

②

Textbook exercise 1.c.: _____

②

Textbook exercise 1.d.: _____

④

Textbook exercise 3.c.:

Iteration	Area of One New Circle	Number of New Circles Added	Increase in Area	Total Area
1		2		
2				
3				
4				

②

Textbook exercise 3.d.: _____

- ④ 4. Refer to exercise 4 of “Exercises: Checking Your Skills,” on page 291 of the textbook. Calculate the surface area and volume of the spheres in the fifth iteration. Round your answers to 2 decimal places.

Return to page 37 of the Student Module Booklet and continue with Activity 4.

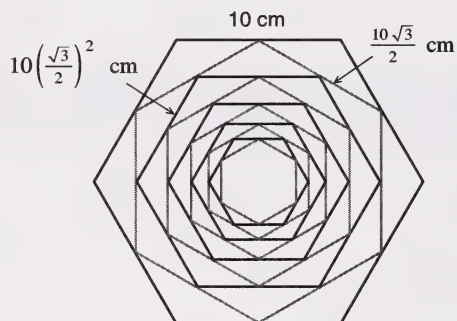
5. Answer exercises 4.a. and 4.b. of “Exercises: Extending Your Thinking” on page 282 of the textbook.

- ③ **Textbook exercise 4.a.:**

3

Textbook exercise 4.b.: _____

6. Consider the sequence of perimeters. Each hexagon, after the first, is built by joining the midpoints of the previous hexagon.



2

- a. Determine the length of one side of the hexagon in the seventh iteration. Round answer to two decimal places.

2

- b. How could you use your answer in question 6.a. to determine the perimeter of the hexagon created in the seventh iteration?

3

- c. What is the perimeter of the tenth hexagon? Show and explain your solution. Round your answer to 2 decimal places.

3

- d. The perimeter of an iteration of this fractal is the sum of the perimeters of all of the hexagons drawn. What is the total perimeter of the sixth iteration? Show and explain your solution. Round your answer to 2 decimal places.

4

7. The perimeter of the coast of Prince Edward Island can be determined using a string and an atlas. Write a paragraph explaining how the perimeter of the coast of Prince Edward Island, when determined using this method, would differ on a map with a scale of 1:10 000 000 compared to a map with a scale of 1:2 000 000.

40

Module Review Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

Answer questions 1 to 6 in this assignment on the answer sheet provided on page 17 of this Assignment Booklet. The answer sheet is similar to the one that will be used on the Diploma Examination for Applied Mathematics 30. Read the following information before proceeding.

Multiple Choice

- Decide which of the choices **best** completes the statement or answers the question.
- Locate that question number on the separate answer sheet provided, and fill in the circle that corresponds to your choice.

Example

This assignment is for the subject of

- A. biology
- B. physics
- C. chemistry
- D. mathematics

Answer Sheet

☐ A ☐ B ☐ C ☒

Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.
- If an answer is a value between 0 and 1 (e.g., 0.7), then be sure to record the 0 before the decimal place.
- Enter the first digit of your answer in the left-hand box. Any boxes on the right that are not needed are to remain blank.

Examples

Calculation Questions and Solutions

The value of $\tan 35^\circ$, to the nearest tenth, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Calculator value: 0.700 207 5

Value to be recorded: 0.7

Record 0.7 on the answer sheet. →

0	.	7	
---	---	---	--

● ○

● ○ ○ ○

○ 1 1 1

○ 2 2 2

○ 3 3 3

○ 4 4 4

○ 5 5 5

○ 6 6 6

○ 7 ● 7

○ 8 8 8

○ 9 9 9

A particular matrix operation produces the equation

$$2 \begin{bmatrix} 1 & 0.5 \\ 1.5 & 4 \end{bmatrix} = \begin{bmatrix} a & b \\ c & 8 \end{bmatrix}$$

In the equation above, the value of

a is _____ (Record in the **first** column.)

b is _____ (Record in the **second** column.)

c is _____ (Record in the **third** column.)

(Record all **three digits** of your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 213

Record 213 on the answer sheet. →

2	1	3	
---	---	---	--

0	0	0	0
1	●	1	1
●	2	2	2
3	3	●	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Correct-Order Question and Solution

Four different sets of data produce the following standard deviations.

- | | | | |
|---|-----|---|-----|
| 1 | 0.3 | 2 | 2.4 |
| 3 | 1.6 | 4 | 1.9 |

When these four standard deviations are arranged in order from **lowest** to **highest**, the order is _____, _____, _____, and _____.

(Record all **four digits** of your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 1342

Record 1342 on the answer sheet. →

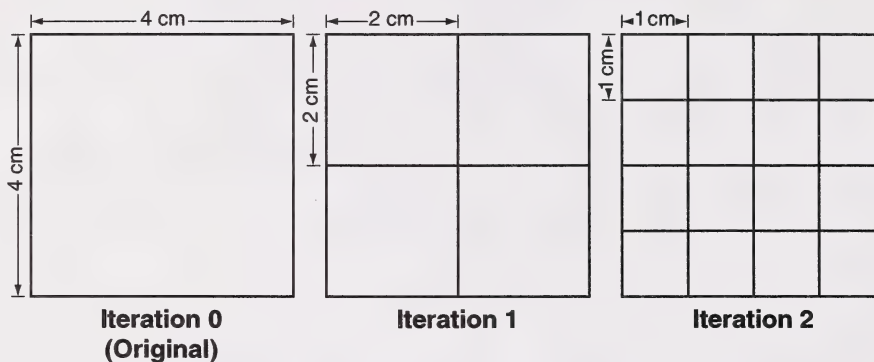
1	3	4	2
---	---	---	---

0	0	0	0
●	1	1	1
2	2	2	●
3	●	3	3
4	4	●	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

2. 1. What is the common ratio of the sequence 6, 24, 96, 384, ...?
- A. $\frac{1}{4}$
B. 18
C. 4
D. -6
2. 2. A sequence with a common difference of -4.8 is
- A. 14.4, 9.6, 4.8, 0, -4.8 , -9.6 , ...
B. 0, -4.8 , $+9.6$, -14.4 , $+19.2$, ...
C. -4.8 , -4.8 , -4.8 , ...
D. 4.8, 9.6, 14.4, 19.2, ...
3. 3. A doctor prescribes a 75-mg pill to be taken every morning. Fifteen percent of the medication is eliminated from the body every day. If the patient takes one pill every day, how many days does it take for the medication to reach its maintenance level?
- A. 10 days
B. 15 days
C. 25 days
D. 45 days
4. 4. Which of the following four sequences is geometric?
- A. 3.14, 5.14, 7.14, ...
B. 4, 8.944, 20, ...
C. 6, 9, 4.5, 6.75, ...
D. 819, 728, 910, ...

Use the following information to answer questions 5 and 6.

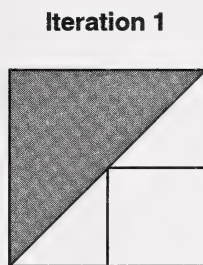
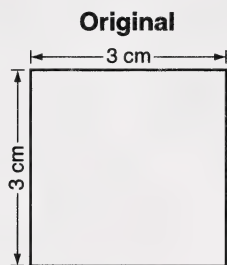
The following diagrams show the original square and the first two iterations of a fractal pattern. Each side of the square in iteration 0 is bisected to form four new squares in iteration 1. Iteration 2 is formed by bisecting the sides of each small square in iteration 1, which results in 16 new smaller squares.



5. If this pattern continues, how many of the smallest-sized squares will there be in iteration 5?
- A. 1024
B. 256
C. 64
D. 28
6. The lengths of the sides of each new square formed is halved after each iteration (as shown in the diagram). What is the area of each new square formed in iteration 4?
- A. $\frac{1}{2} \text{ cm}^2$
B. $\frac{1}{4} \text{ cm}^2$
C. $\frac{1}{8} \text{ cm}^2$
D. $\frac{1}{16} \text{ cm}^2$

Use the following information to answer numerical-response question 1.

A student has a square piece of paper that is 3 cm by 3 cm. The student draws a diagonal of this square and shades the region of the square above this diagonal. In the unshaded region, the student then draws a second square by using the midpoint of the diagonal as one corner. This process produces iteration 1. The process is then continued with the smaller square, as shown in iteration 2.



Numerical Response

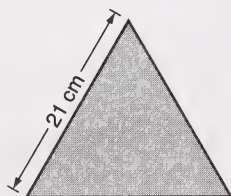
2

1. The total area of the shaded regions shown in the diagram for iteration 2, correct to the nearest tenth, is _____ cm^2 .

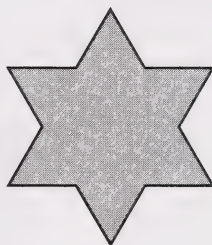
(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer numerical-response questions 2 and 3.

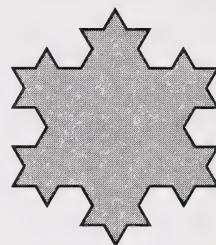
The following diagrams show the original triangle and the first two iterations in the construction of a Koch snowflake. The original triangle is an equilateral triangle with 21-cm sides.



**Iteration 0
(Original)**



Iteration 1



Iteration 2

The following chart shows the relationship between the added perimeter and the total perimeter for the Koch snowflake.

Iteration	Number of Sides	Total Perimeter (cm)
0	3	63
1	12	84
2	48	

Numerical Response

2. The total perimeter of iteration 2, to the nearest centimetre, is _____ cm.
(Record your answer in the numerical-response section on the answer sheet.)
3. Exponential regression can be used to relate iteration number to total perimeter and to determine the perimeter of a particular iteration of this Koch snowflake. Based on an exponential regression of the perimeters of iterations 0, 1, and 2, the perimeter, to the nearest centimetre, of iteration 8 will be _____ cm.
(Record your answer in the numerical-response section on the answer sheet.)

7. A ball bounces to 70% of the height from which it is dropped.

3

- a. Complete a table with the first 10 successive rebound heights of a ball that has been dropped from an initial height of 2.8 m. Round your values to 5 decimal places where necessary.

1

- b. How high does the ball rebound on the sixth bounce? Round your answer to 2 decimal places.

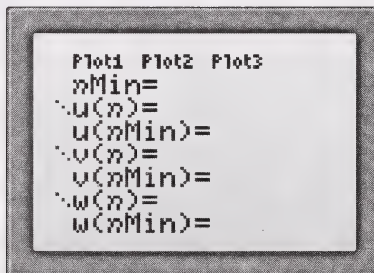
1

- c. On which bounce does the ball first rebound to a height less than 0.10 m?

8. A bacterium divides every 10 minutes. Create a sequence using the Sequence mode on your calculator.

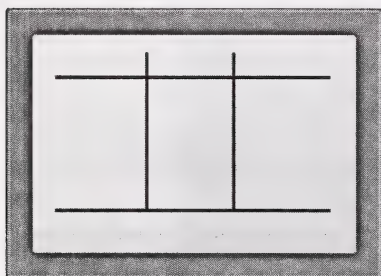
②

- a. Complete the following information.



②

- b. Using the Table feature on your calculator, write the first 5 terms of the sequence. Is the sequence arithmetic or geometric?



②

- c. Graph the data on your calculator. How can you tell from the graph whether the sequence is arithmetic or geometric?

②

- d. How many bacteria are there after 50 min? after 3 h?

9. In Olympic competition, certain substances are banned. Some herbal medicines contain these substances. One athlete took an herbal medicine containing the banned substance ephedrine. It has a half-life of about 4 h. Suppose the athlete took a 200-mg dose of ephedrine at 7:00 A.M.

②

- a. Calculate the number of milligrams of ephedrine that remain in the athlete's body at the end of every four-hour period, up to 11:00 P.M.

①

- b. Estimate the amount of ephedrine in the athlete's body at 10:30 A.M.

- ③ 10. You own a nursery. You begin your business by planting 1000 tree seedlings. Every year you sell 12% of the trees that are at least one year old and plant 121 more seedlings.
- a. Use a spreadsheet to describe the number of trees at the end of each year up to 10 years. Attach a printout of your spreadsheet in the space provided.

- ① b. How many trees will there be in the nursery at the end of the tenth year?

- ② c. Describe the growth of the nursery over time. Will the nursery's size ever stabilize? If so, in how many years and how many trees will the nursery have?

Answer Sheet

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)
6. (A) (B) (C) (D)

Numerical Response

1.

--	--	--	--

•	•		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

2.

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•	•		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

3.

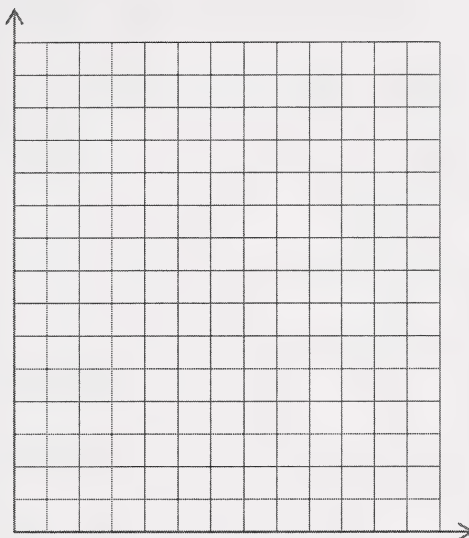
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•	•		
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Return to page 38 of the Student Module Booklet and continue with the Module Review.
 If your teacher has indicated that the Module 6 project does not need to be completed,
 submit Assignment Booklet 6B to your teacher for assessment.

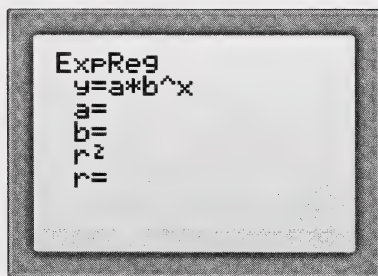
②

Textbook exercise 1.b.:



②

Textbook exercise 1.c.:



①

Textbook exercise 1.d.i.: _____

①

Textbook exercise 1.d.ii.: _____

①

Textbook exercise 1.e.: _____

①

Textbook exercise 1.f.: _____

⑤

Textbook exercise 2.a.:

Elapsed Time (h)	Time of Day	Amount of Caffeine Remaining (mg)

②

Textbook exercise 2.b.: _____

10

2. Write a report on the effects of caffeine on the human body. Attach your report to this booklet securely. It will be graded based on the following characteristics. Each characteristic will be awarded from 0 points (characteristic are not apparent in the report) to 5 points (characteristic are shown at a superior level). The total number of points obtained will be divided by 3 to obtain the grading out of 10 marks.

Appropriateness	0	1	2	3	4	5
Knowledge	0	1	2	3	4	5
Clarity	0	1	2	3	4	5
Creativity	0	1	2	3	4	5
Quality	0	1	2	3	4	5
Effort	0	1	2	3	4	5

You will want to check to see that, at a minimum, the following items are included within your report:

- ☐ a title
- ☐ some history of caffeine
- ☐ sources of caffeine
- ☐ effects of caffeine on the body
- ☐ a graph showing the rate of excretion of caffeine from the body
- ☐ effects of rapid withdrawal from caffeine use
- ☐ effects of large doses of caffeine on the body
- ☐ a list of resources you used to obtain information (minimum 4 items)

10

3. Create a poster explaining the affects of caffeine on the human body (as outlined on page 292 of the textbook). Attach your poster to this booklet securely. It will be graded based on the following characteristics. Each characteristic will be awarded from 0 points (characteristic are not apparent in the poster) to 5 points (characteristic are shown at a superior level). The total number of points obtained will be divided by 3 to obtain the grading out of 10 marks.

Appropriateness	0	1	2	3	4	5
Knowledge	0	1	2	3	4	5
Clarity	0	1	2	3	4	5
Creativity	0	1	2	3	4	5
Quality	0	1	2	3	4	5
Effort	0	1	2	3	4	5

You will want to check to ensure that, at a minimum, the following items are included on your poster:

- ☐ a title
- ☐ some history of caffeine
- ☐ sources of caffeine
- ☐ effects of caffeine on the body
- ☐ a graph showing the rate of excretion of caffeine from the body
- ☐ a half-life diagram

Submit your completed Assignment Booklet 6B to your teacher for assessment.

